

A NEW SCIENCE OF LIFE?

Rupert Sheldrake is an English biochemist who studied cell biology, the development of plants and the ageing of cells. In 1983 he published *A New Science of Life: The Hypothesis of Formative Causation*, written over a year and a half in an ashram in southern India. This book provoked great controversy, leading journal *Nature* saying that it was "the best candidate for burning for many years".



The questions Sheldrake tries to answer are ones that have remained unanswered although widely recognised by other biologists. If he is right our understanding of the evolution of biological forms has been completely revised, if he is wrong the debate that has ensued can only help in the search for answers that have so far eluded orthodox science.

His theory of formative causation is deceptively simple and has intuitive appeal because it connects the past with the present in a direct, though intangible, way. As such it is a causal factor unrecognised by physics and is outside the conventional, mechanistic approach that science is built upon. This approach treats living organisms as complex machines obeying the laws of physics and chemistry and seeks to explain life in terms of these laws. While extraordinarily successful in detailing the components and workings of organisms it has led to only a limited understanding of the complexity of life. Sheldrake is seeking a broader science of life.

What his hypothesis suggests is that present forms of life are influenced by previous generations of the same type; it is concerned with the repetition of forms. The greater the numbers the greater the influence, so it becomes more likely over time that current forms will be patterned on their ancestors. While this sounds like a reasonable proposition it has some amazing implications. It is also a radical departure from the idea that all lifeforms are solely determined by their genetic inheritance.

Morphogenetic Fields

Formative causation works through what Sheldrake has called *morphogenetic fields*. These can be regarded as analogous to known fields of physics because the effects they cause are observable even though they themselves are not, like gravitational or electromagnetic fields. Since each type of organism has its own characteristic form each must have its own specific kind of morphogenetic field - one for protozoa, one for amoeba, one for muscle cells of earthworms, another for sheep's kidneys, one for elephants, another for each type of tree and so on. At all levels of complexity the forms of systems are developed and maintained by morphogenetic fields.

Morphogenetic fields do not act alone, but in conjunction with traditional energetic and chemical causes studied by biophysicists. However something has to account for the emergence of pattern and form in organisms, and Sheldrake suggests that this is due to the action of specific morphogenetic fields. These are hierarchically organised, from cells to tissues to organs then to organisms as a whole, working at each level to organise the processes of growth and development. The higher-level fields restrict and pattern the lower ones.

The idea of a causal influence from previous similar forms requires an action across space and time unlike any known type of physical action. The medium for this action is called *morphic resonance*, which operates like radio transmissions that can be picked up by tuning a receiver to a particular frequency. Present forms are receivers for the 'transmissions' from the past and so their development is influenced by these

past forms - in Sheldrake's phrase 'the forms of past systems influence all subsequent similar systems'. This does not mean that there are not differences in detail between past and present similar forms, but there is a process of averaging, with those features that most past forms have in common being reinforced. Receptivity to specific morphic frequencies depends on the system or organism's internal structure and organisation.

As time goes on the cumulative influence of previous systems confers increasing stability on the morphogenetic field and the more likely it is to be repeated in the future. There is a pathway of *morphogenesis* (the coming into being of characteristic and specific forms) that is created and strengthened by succeeding generations.

Formative Karma

Sheldrake contrasts his theory of formative causation with what he calls the 'conventional' theory. This is the mechanistic, materialist view that all life forms are solely dictated by their genetic and chemical structures. The hypothesis of formative causation regards the forms as the *causes* of subsequent similar forms.

"However, this is not a metaphysical but a physical proposition, and is capable of being tested experimentally.

"If this hypothesis is supported by experimental evidence, then not only might it allow the various matter fields of quantum field theory to be interpreted in terms of morphogenetic fields, but it could also lead towards a new understanding of other physical fields." (p. 118)

The hypothesis can be summarised in the following way:

All material units like atoms, molecules, crystals, organs and organisms are given their form and internal structure through non-physical fields called *morphogenetic fields*. Each kind of morphic unit (i.e. material unit) has its own characteristic morphogenetic field. In the morphogenesis of a particular unit all past members of its particular type or species are causally linked to all present members.

"...Organisms of the same variety or race will resemble each other not only because they are genetically similar and subject to similar genetic influences during morphogenesis, but also because their characteristics are reinforced and stabilised by morphic resonance from past organisms of the same variety." (p. 130) Characteristic forms are determined by similar previous forms which act across time and space by a process called *morphic resonance* acting through the morphogenetic field.

Sheldrake isn't suggesting that the causative role of morphogenetic fields is conscious design, but emphasising that not all events are explained by purely physical fields.

The effect formative causation has on the probability of a given creature or object having a given structure is that it determines only the most widespread features of its species. For example, in the development of an organism from a fertilised egg, features appear in a sequence of the organism's



order, family, genus, then species before any characteristics which distinguish the individual from other members of their species appear. In Sheldrake's terminology there is an increasing specificity of morphic resonance during morphogenesis.

Repeatable Experiments

Where Sheldrake differs from other researchers who have proposed holistic theories of form and being is that he claims there are replicable experiments that prove the existence of formative causation. The scientific community usually reacts badly to what they see as metaphysical explanations of problems which can't be solved by conventional reductionist methods.

In his first book, several possible experimental tests are outlined. He considers the case of a newly-synthesised organic chemical which has never existed before (pp. 106-110). According to his theory its crystalline form will not be predictable in advance, but after it has been crystallised for the first time its form will influence subsequent crystallisations by morphic resonance. The more often it's crystallised the stronger this influence should become.

Chemists who have synthesised new chemicals often have great difficulty in getting these substances to crystallise for the first time. But over time, as increasing numbers of past crystals contribute to the morphogenetic field, these substances tend to crystallise more and more easily.

Sheldrake proposes dividing a batch of a newly synthesised chemical into three and separating them and comparing crystal forms under controlled conditions when growing larger batches from them. If the batch which has the largest number of crystals exerts the strongest influence on the form of subsequent crystals, this will be evidence to support Sheldrake's hypothesis.

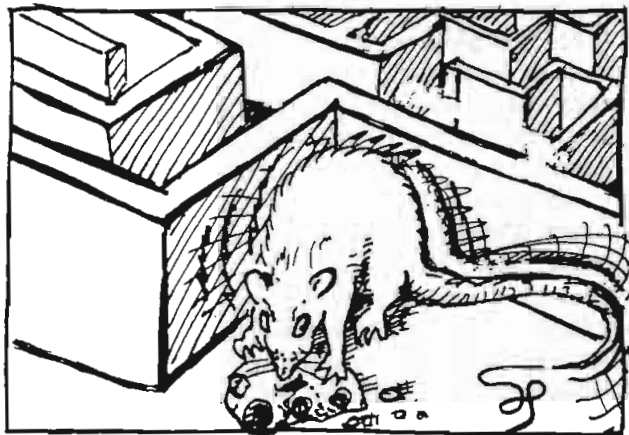
A similar experiment using hybrid seeds is also proposed (pp 133-134). Three batches are grown under controlled conditions to determine contributions of morphic resonance to the characteristics of the plants. Testing for environmental and morphic effects on plants could be done using a new variety of self-pollinated crop, by growing plants in two very different environments. Comparing their effects on an original batch of seeds could show relative effects on the morphology of subsequent plants. Any sort of transmitted environmental influence of this sort is inexplicable in terms of a mechanistic theory.

It's this willingness to propose experiments and have his theories tested by other scientists which distinguishes Sheldrake from many other theorists. He is an excellent scientist and an imaginative plant physiologist and what he proposes is scientifically acceptable. The scientific method is to test theories and hypotheses in order to gather evidence for their proof (verification or falsification).

Biological science has many unsolved problems despite the cracking of the genetic code. The conventional approach argues that a little bit more research will be able to explain these anomalies in physical and chemical terms. This makes the evidence gathered in a large-scale experiment using television virtually inexplicable.

Conventionally Inexplicable

In Sheldrake's television test, a picture containing a hidden image was shown to about 2 million viewers in Britain. A picture hidden within a design was found to be easily recognisable after it had been shown. The pictures were shown for one minute each, always with the overall picture first. Different groups of people were shown the pictures a few days before the TV transmission and tested for their recognition of the hidden picture; this was repeated a few days later. **The proportion recognising the hidden picture increased by 76% after the transmission.**



This increase is statistically significant at the 1% level of probability - that is, there's a probability of less than 1 in 100 that this result was obtained by chance. Parameters were carefully checked, cheating was ruled out and controls were used. These positive results may be explicable by factors other than morphic resonance, but the outcome would seem to make repeating the experiment a good idea.

Sheldrake sees morphogenetic fields as capable of explaining aspects of quantum theory, evolution (not just genetic), instinct and habit - both of which depend on morphic resonance as well as just the physical forms of matter and life. The repetition of behaviour builds up its own morphic resonances which become our instincts and daily habits.

An experiment with rats which was begun in 1920 in the hope of testing Lamarck's theories of inherited characteristics provided results which support the hypothesis of formative causation. One prediction of the theory is that the larger the number of animals that have been trained to complete a specific task in the past, the easier it should be for subsequent, similar animals to learn the same thing.

An increased rate of learning in both trained and untrained rats in successive generations would support the hypothesis. In this experiment (p. 189), the number of errors made by a rat before it learned to leave a tank gave a measure of its rate of learning. The experiment continued for 32 generations and took 15 years to complete; there was a marked tendency for rats in successive generations to learn the task more quickly. The average number of errors made by rats in the first eight generations was 56, but by the last generation only 20 mistakes was the average.

A critic of this experiment repeated it in Edinburgh over 18 generations and included a parallel line of untrained rats, which were tested for their rate of learning as a control. For some reason, all the rats found it much easier to learn the task in this second experiment than in the first! A considerable number of rats in both trained and untrained lines actually knew how to do the task immediately. The average score of the Edinburgh rats at the beginning of the experiment was similar to the result of rats tested in the previous Harvard experiment after 30 generations.

The experiment was carried out again in Melbourne where the rates of learning of trained and untrained lines were measured for 50 successive generations over 20 years. A marked tendency for rats of the trained line to learn more quickly in subsequent generations was found - but exactly the same tendency was also found in the untrained line.

The results of these experiments - which began 70 years ago - are completely inexplicable using any orthodox scientific idea but are seen differently in the light of the hypothesis of formative causations.

Perhaps the now-debunked New Age "Hundredth Monkey" story propounded by Ken Keyes was the right idea on the wrong track - or another example of morphic resonance.

Available from Adyar and T.S. Bookshops, *A New Science of Life - The Hypothesis of Formative Causation* by Rupert Sheldrake (Paladin).

Gerard